DACA42-02-C-0001

LOGANEnergy

United States Coast Guard Operations Facility PEM Fuel Cell Demonstration Project
United States Coast Guard Station, New Orleans, Louisiana
Midterm Report

Proton Exchange Membrane (PEM) Fuel Cell Demonstration
Of Domestically Produced PEM Fuel Cells in Military Facilities

US Army Corps of Engineers
Engineer Research and Development Center
Construction Engineering Research Laboratory
Broad Agency Announcement CERL-BAA-FY01

United States Coast Guard Station
New Orleans, Louisiana

June 8, 2004

Executive Summary

In May 2003, LOGANEnergy Corporation received a contract modification to its CERL BAA FY01 PEM Demonstration contract award that added the US Coast Guard Operations Center in New Orleans, LA to its project sites. LOGAN completed the installation of one Plug Power GenSys5C PEM demonstration at the station and started the unit on August 22, 2003. However, the Demonstration Period did not commence until October 27, 2003 since communications with the unit was not available through the Ethernet connection until that time.

The Combined Heat and Power installation operates electrically in a grid parallel/grid independent configuration that ties several kitchen appliances and convenience outlets onto the fuel cell's critical load panel. The facility's hot water heater captures the unit's waste heat output. The installation is instrumented with an external wattmeter, thermocouples, a water flow meter, and a gas flow meter. A phone line is connected to the power plant communication's modem providing bi-directional communications with factory technical service, to improve remote trouble shooting and service dispatches. In addition, this site hosts LOGAN's first online data gathering and management system that provides real time operational control, management and alarming.

The Point of Contact for this project is Petty Officer George Dunn. He may be reached at (504) 846-6181. The total estimated energy cost premium to the host site as a result in participating in this demonstration project is -$371.88.

Table of Contents

Proposal – Proton Exchange Membrane (PEM) Fuel Cell Demonstration of Domestically Produced Residential PEM Fuel Cells in Military Facilities

1.0 Descriptive Title

United States Coast Guard Operations Facility PEM Demonstration Project, United States Coast Guard Station, New Orleans, Louisiana

2.0 Name, Address and Related Company Information

LOGANEnergy Corporation

1080 Holcomb Bridge Road
BLDG 100- 175
Roswell, GA 30076
(770) 650- 6388

DUNS 01-562-6211
CAGE Code 09QC3
TIN 58-2292769

LOGANEnergy Corporation is a private Fuel Cell Energy Services company founded in 1994. LOGAN specializes in planning, developing, and maintaining fuel cell projects. In addition, the company works closely with manufacturers to implement their product commercialization strategies. Over the past decade, LOGAN has analyzed hundreds of fuel cell applications. The company has acquired technical skills and expertise by designing, installing and operating over 30 commercial and small-scale fuel cell projects totaling over 7 megawatts of power. These services have been provided to the Department of Defense, fuel cell manufacturers, utilities, and other commercial customers. Presently, LOGAN supports 30 PAFC and PEM fuel cell projects at 21 locations in 12 states, and has agreements to install 22 new projects in the US and the UK over the next 18 months.

3.0 Production Capability of the Manufacturer

Plug Power manufactures a line of PEM fuel cell products at its production facility in Latham, NY. The facility produces three lines of PEM products including the 5kW GenSys5C natural gas unit, the GenSys5P LP Gas unit, and the GenCor 5kW standby power system. The current facility has the capability of manufacturing 10,000 units annually. Plug will support this project by providing remote monitoring, telephonic field support, overnight parts supply, and customer support. These services are intended to enhance the reliability and performance of the unit and achieve the highest possible customer satisfaction. Scott Wilshire is the Plug Power point of contact for this project. His phone number is 518.782.7700 ex1338, and his email address is scott_wilshire@plugpower.com.

4.0 Principal Investigator(s)

Name	Samuel Logan, Jr.	Keith Spitznagel
Title	President	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	860.210.8050
Fax	770.650.7317	770.650.7317
Email	samlogan@loganenergy.com	kspitznagel@loganenergy.com

5.0 Authorized Negotiator(s)

Name	Samuel Logan, Jr.	Keith Spitznagel
Title	President	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	860.210.8050
Fax	770.650.7317	770.650.7317
Email	samlogan@loganenergy.com	kspitznagel@loganenergy.com

6.0 Past Relevant Performance Information

a) Contract: PC25 Fuel Cell Service and Maintenance Contract #X1237022

Merck & Company
Ms. Stephanie Chapman
Merck & Company
Bldg 53 Northside
Linden Ave. Gate
Linden, NJ 07036
(732) 594-1686

Contract: Four-year PC25 PM Services Maintenance Agreement.
In November 2002 Merck & Company issued a four-year contract to LOGAN to provide fuel cell service, maintenance and operational support for one PC25C fuel cell installed at their Rahway, NJ plant. During the contract period the power plant has operated at 94% availability. LOGAN performs the quarterly and annual service prescribed by the UTC, and performs other maintenance as required. The periods of unavailability are chiefly due to persistent inverter problems that seem to be endemic to the Toshiba power conditioning balance of the system. Field modifications and operating adjustments have largely cured the problem. Quarterly service events take 10 hours to complete with the unit under load, and the annual event takes approximately 35 hours with the unit shut down.

b) Contract: Plug Power Service and Maintenance Agreement to support one 5kWe GenSys 5C and one 5kWe GenSys 5P PEM power plant at NAS Patuxant River, MD.

Plug Power
Mr. Scott Wilshire.
968 Albany Shaker Rd.
Latham, NY 12110
(518) 782-7700 ex 1338

LOGAN performed the start-up of both units after Southern Maryland Electric Cooperative completed most of the installation work. The units are located at residential sites at Patuxant River Naval Air Station, VA and operate in standard gird connected/grid independent configurations. Both operate at 4.5kWe and have maintained 98% availability. The units, S/Ns 241 and 242 are two of the very latest GenSys models to reach the field. S/N 242 is Plug Power's first LPG fueled system to go into the field. Both have set a new level of performance expectations for this product, and are indicative of the success of the various test and evaluation programs that have been conducted over the past two years.

c) Contract: A Partners LLC Commercial Fuel Cell Project Design, Installation and 5-year service and maintenance agreement.
Contract # A Partners LLC, 12/31/01

Mr. Ron Allison
A Partners LLC
1171 Fulton Mall
Fresno, CA 93721
(559) 233-3262

On April 20, 2004 LOGAN completed the installation of a 600kWe PC25C CHP fuel cell installation in Fresno, CA. The system operating configurations allow for both grid parallel and grid independent energy service. The grid independent system is integrated with a multi unit load sharing electronics package and static switch, which initial development was funded by ERDC CERL in 1999. This is the third fuel cell installation that uses the MULS System. The thermal recovery package installed in the project includes a 100-ton chiller that captures 210 degree F thermal energy supplied by the three fuel cells to cool the first three floors of the host facility. The fuel cells also provide low-grade waste heat at 140 degrees F that furnishes thermal energy to 98 water source heat pumps located throughout the 12-story building during the winter months.

7.0 Host Facility Information

The U. S. Coast Guard Station, New Orleans, is located in Metairie, Louisiana, on the south shore of Lake Pontchartrain. The Station maintains a 24-hour operational capability to support launches and recoveries of U.S. Coast Guard Sea-Air Rescue, U.S. Customs Alert, and 159th Fighter Group/Louisiana Air National Guard.
Entergy provides the station's electricity and natural gas.

8.0 Fuel Cell Installation

In February 2003, representatives from LOGANEnergy met with Petty Officer George Dunn at the US Coast Guard Operations Center in New Orleans to confirm the command's previously expressed interest in hosting a 5 kW PEM Fuel Cell demonstration unit at the facility. Mr Dunn expressed strong interest on behalf of the station commander to participate in the PEM program. In May of 2003, LOGAN received supplemental funding under its FY'01 PEM contract to proceed with the PEM Demonstration at the Coast Guard Station. In early June 2003, LOGAN and CERL conducted the project kick-off meeting at the facility with Coast Guard representatives to cover the objectives of the project and to finalize the installation plan. Plug Power shipped GenSys SN#196 fuel cell to the Coast Guard facility in early July 2003, and on August 27, 2003, LOGAN started the unit for the first time.
The installation is unique because the fuel cell sits on a second story deck of the operations facility. Figure 1, below, shows the fuel cell on its pad on the second level deck of the Coast Guard Operations Center. The fuel cell was partially disassembled to accommodate the weight restrictions on the service elevator, and then rolled into place with a hand truck and dolly, then rigged onto its footings with the assistance of fork truck.

Figure 1

Figure 2, below, diagrams the fuel cell installation with utility interfaces including, natural gas, power and water supply for the site. The installation includes LOGAN's first Ethernet communications system designed by Connected Energy Corporation for the project. Note how data wiring from several source outputs are routed to the web interface control panel. The information is transmitted via the web to Connected Energy's data center in Rochester, New York, where it is formatted for display on several control and management screens.

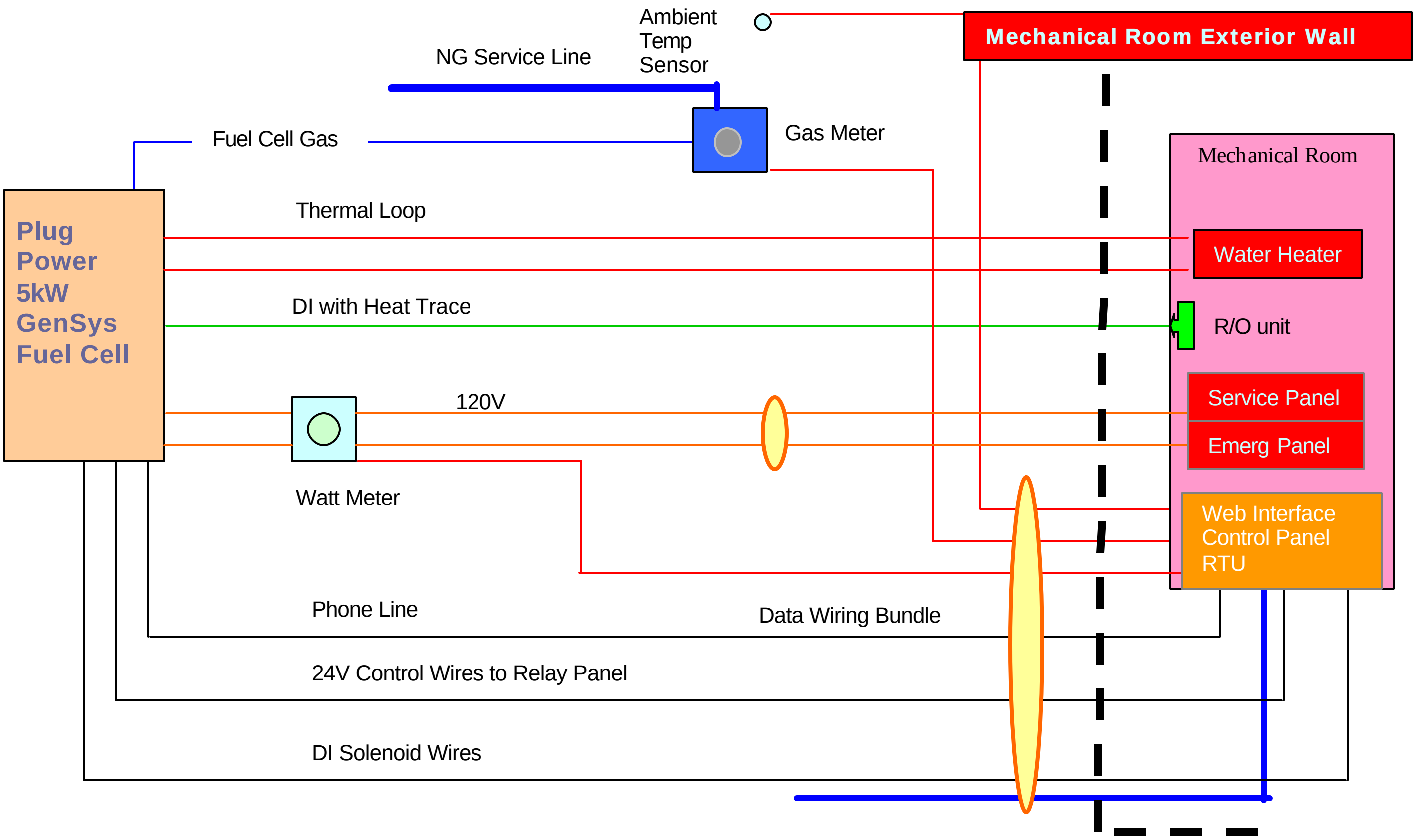


Figure 2, U.S. Coast Guard Installation Line diagram

LOGAN's contractor procured electrical and plumbing permits that were necessary to construct the site. Neither air quality permits nor grid interconnect permits were necessary to complete the project.

9.0 Electrical System

The Gensys5C fuel cell at this site has the new MP5 inverter that has a power output of 110/120 VAC at 60 Hz, matching the facility's distribution panel located in the mechanical room with its connected loads at 110/120 VAC. The inverter permits the fuel cell installation to operate in both a grid parallel/grid independent configuration as shown in Figure 3, below. The installation circuitry includes a two-pole wattmeter that records fuel cell power over both the line and load conductors. These are wired to the existing service panel and the new critical load panel installed in the equipment room, respectively. A double throw service disconnect, installed at the meter, is an added safety feature that permits the service technician to isolate the fuel cell from the grid in order to perform maintenance without disturbing the power service to the facility. Figure 3, below, illustrates the wiring configuration that LOGAN used to accomplish this. Figure 4 is an actual photo of the installation.

Even though the fuel cell is in direct communication with the local electric grid operated by Entergy, the utility company did nor register any interest or concern with the project despite repeated calls for interconnection guidance.

Figure 3

Circuit Control Safety Electrical Diagram

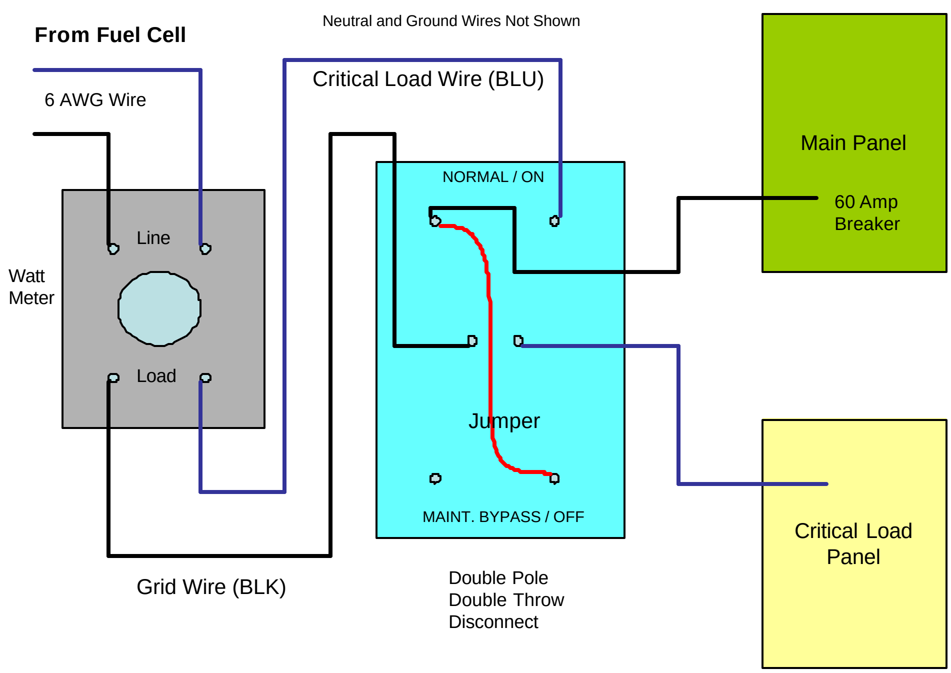


Figure 4

10.0 <u>Thermal Recovery System</u>

In contrast to other sites, where LOGAN installed a hot water heater with indirect heating coils, this site employs a Heliodyne heat exchanger to capture fuel cell waste heat and transfer it into the facility's hot water system. The Heliodyne is a coil within a coil design, described in <u>Figure 6</u>, that provides double wall protection between the heat source and the heat sink in order to prevent contamination of potable water supplies. It was designed primarily for the solar heating industry, but proved to be very adaptable to this installation. In <u>Figure 5</u>, below, the Heliodyne can be seen mounted directly to the facility's existing commercial hot water heater. It has its own pump that circulates the storage tank in a counter flow against incoming hot water provided by the fuel cell's heat exchanger. While operating at a set point of 2.5 kWh, the fuel cell provides 7800 Btuh to the storage tank at approximately 140 degrees F. Later in the project LOGAN hopes to gain the cooperation of the customer in order to thermally map the system to develop a clear picture of its effectiveness.

Figure 5

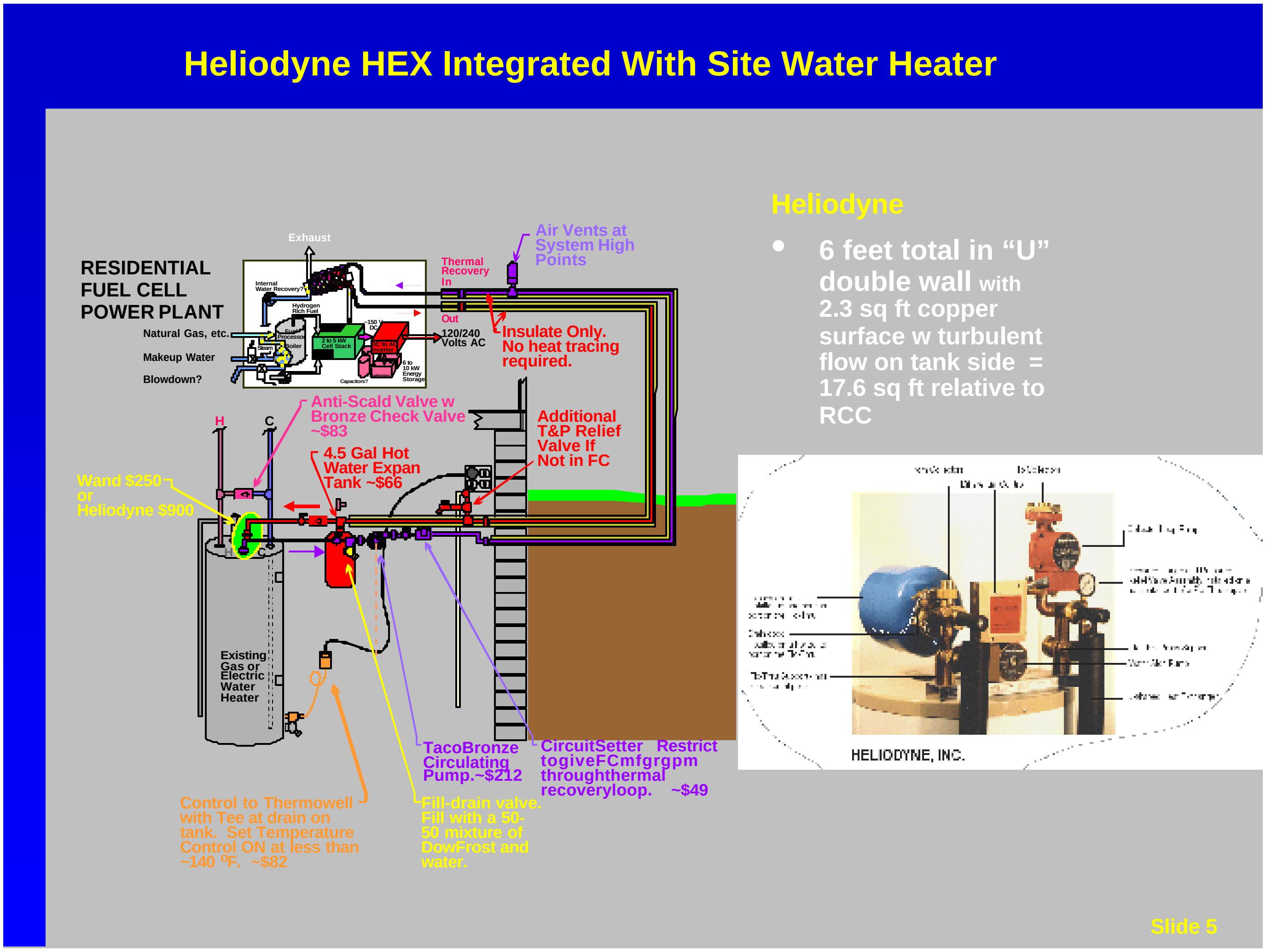

Heliodyne HEX Integrated With Site Water Heater
Heliodyne
6 feet total in "U" double wall with 2.3 sq ft copper surface w turbulent flow on tank side = 17.6 sq ft relative to RCC
RESIDENTIAL FUEL CELL POWER PLANT
Exhaust
Natural Gas, etc.
Makeup Water
Blowdown?
Thermal Recovery In
Out
120/240 Volts AC
Air Vents at System High Points
Insulate Only. No heat tracing required.
Anti-Scald Valve w Bronze Check Valve ~$83
4.5 Gal Hot Water Expan Tank ~$66
Additional T&P Relief Valve If Not in FC
Wand $250 or Heliodyne $900
H
C
Existing Gas or Electric Water Heater
TacoBronze Circulating Pump.~$212
CircuitSetter Restrict togiveFCmfgrgpm throughthermal recoveryloop. ~$49
Control to Thermowell with Tee at drain on tank. Set Temperature Control ON at less than ~140 ºF. ~$82
Fill-drain valve. Fill with a 50-50 mixture of DowFrost and water.
HELIODYNE, INC.
Slide 5

Figure 6

11.0 Data Acquisition System

Over the course of developing the several sites in the FY01 PEM Program, LOGAN has encountered great difficulty in acquiring a dedicated phone line for the fuel cell at every site. In the best case this has delayed starting the demonstration period by three weeks. Most sites have proven far more difficult. At this site, the Coast Guard was unable to provide a discrete line to the fuel cell modem for two months following the initial start. Fortunately, the new but untested Web communications system (described below) was running intermittently during that period, but since it lacks the ability to send out a high speed data packet following a shutdown, the site was nevertheless handicapped by the unavailability of this important information needed to troubleshoot system failures. These experiences have taught LOGAN to be very explicit with the host POC at the kick-off meetings concerning the necessity for providing a dedicated phone line, since much of the success of the project is dependent upon reliable communications with the unit.

Beginning with the Coast Guard Project, LOGAN decided to experiment with a new web based, real time, data management and reporting system. To do this LOGAN contracted with Connected Energy Corporation, CEC, to provide the service. The drawing seen in Figure 7 describes the architecture of the CEC system operating at the site. The system provides a comprehensive data acquisition solution and also incorporates remote control, alarming, remote notification, and reporting functions. CEC's Central Operations Control Center in Rochester, New York, collects, stores, displays, alarms, archives site data, and maintains connectivity with the site.

With the introduction of this system, LOGAN has learned a number of important lessons in the emerging world of Web based CHP asset management. Initially the Coast Guard permitted the installation to "piggyback" on its LAN in order to provide connectivity between the fuel cell and the CEC control center. To accomplish this, the control center assigned a discrete Internet Protocol (IP) address to the high-speed modem in the terminal unit (Figure 7) at the site. This permits the control center to establish a secure Virtual Private Network (VPN) link with the unit. At the same time, the Coast Guard also gave LOGAN permission to use their LAN while onsite to access the data screens. However, on December 5 2003, high-level Coast Guard Security officials cut their LAN service to the fuel cell indicating to LOGAN that the connection violated their new security protocols. From that point, until March 8, 2004 when LOGAN reconnected the site VPN via a commercial ISP account, the unit operated without being able to capture performance data. Plug Power did, however continue to receive power plant data through its daily call out to the unit. Since that experience, LOGAN has relied exclusively on commercial high-speed ISP providers.

Another important lesson that LOGAN has learned with this system is the critical role that individual instrumentation components play in supplying the data to the web interface. The CEC system requires very precise signals from the outputs of these devices. The gas meters, wattmeters, flow meters and thermal elements invariably require signal strength adjustments at the RTU terminals to insure that their discrete inputs are readable by the CEC system. Discovering the proper voltage range required for each signal loop is most often achieved by trail and error, requiring multiple site visits to establish a readable connection. However, the field experience learning curve has been rapid, and LOGAN is building a body of knowledge and expertise with this system that will yield improved results and better data at new sites in the future. Figure 8 is an example of one of many data screens that are maintained by the CEC system and displayed on the web. Sample data graphs are also attached to Appendix 1 providing performance data for the period of October 2003 through March 2004.
To view the operation of this unit online, go to: https://www.enerview.com/EnerView/login.asp
Login as: logan.user and enter password: guest. Select the box labeled 4th District Coast Guard. Then you may navigate the Coast Guard site or other sites using the tool bars or html keys.

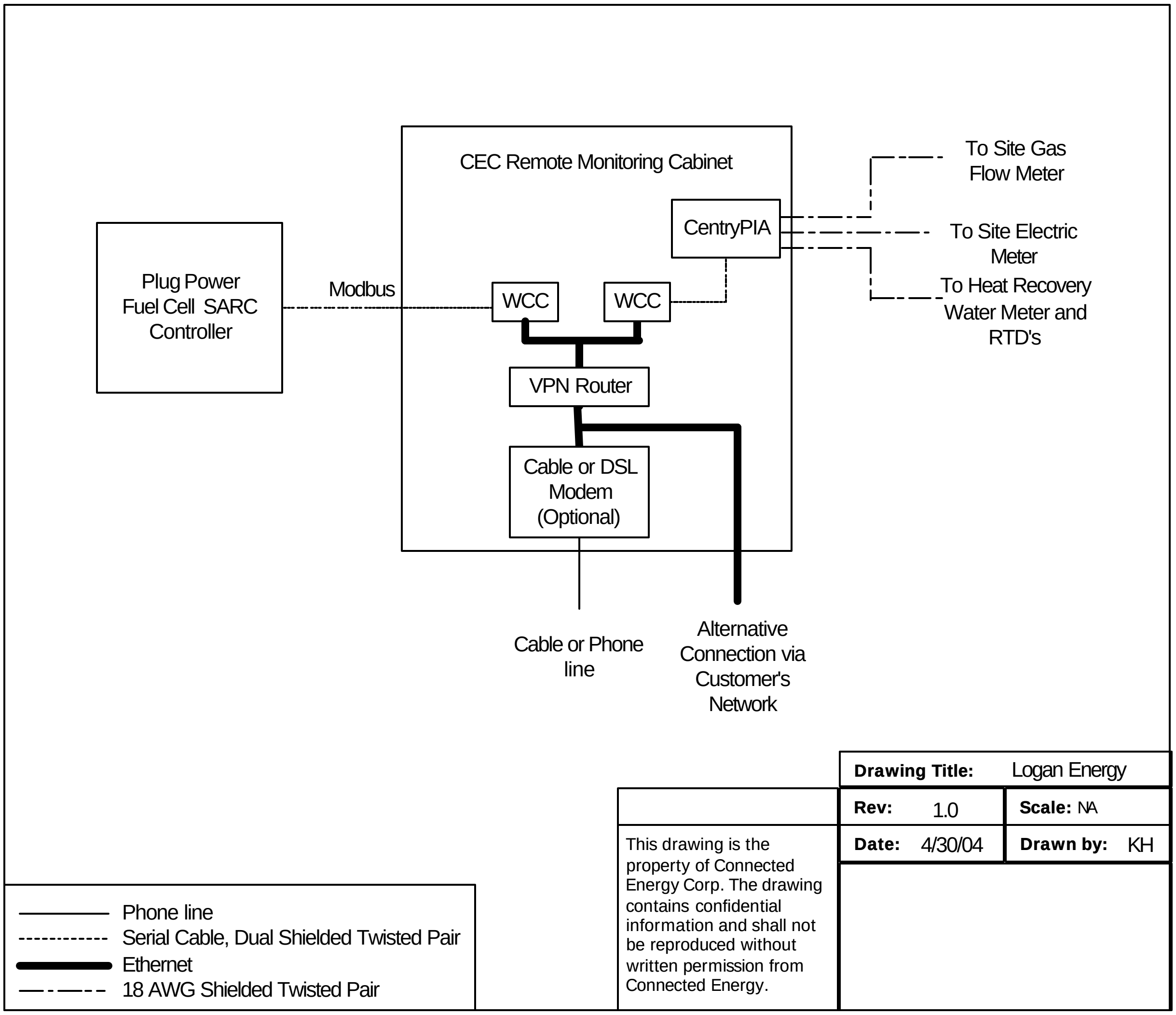

CEC Remote Monitoring Cabinet
CentryPIA
To Site Gas Flow Meter
To Site Electric Meter
To Heat Recovery Water Meter and RTD's
Plug Power Fuel Cell SARC Controller
Modbus
WCC
WCC
VPN Router
Cable or DSL Modem (Optional)
Cable or Phone line
Alternative Connection via Customer's Network
Phone line
Serial Cable, Dual Shielded Twisted Pair
Ethernet
18 AWG Shielded Twisted Pair
This drawing is the property of Connected Energy Corp. The drawing contains confidential information and shall not be reproduced without written permission from Connected Energy.
Drawing Title: Logan Energy
Rev: 1.0
Scale: NA
Date: 4/30/04
Drawn by: KH

Figure 7

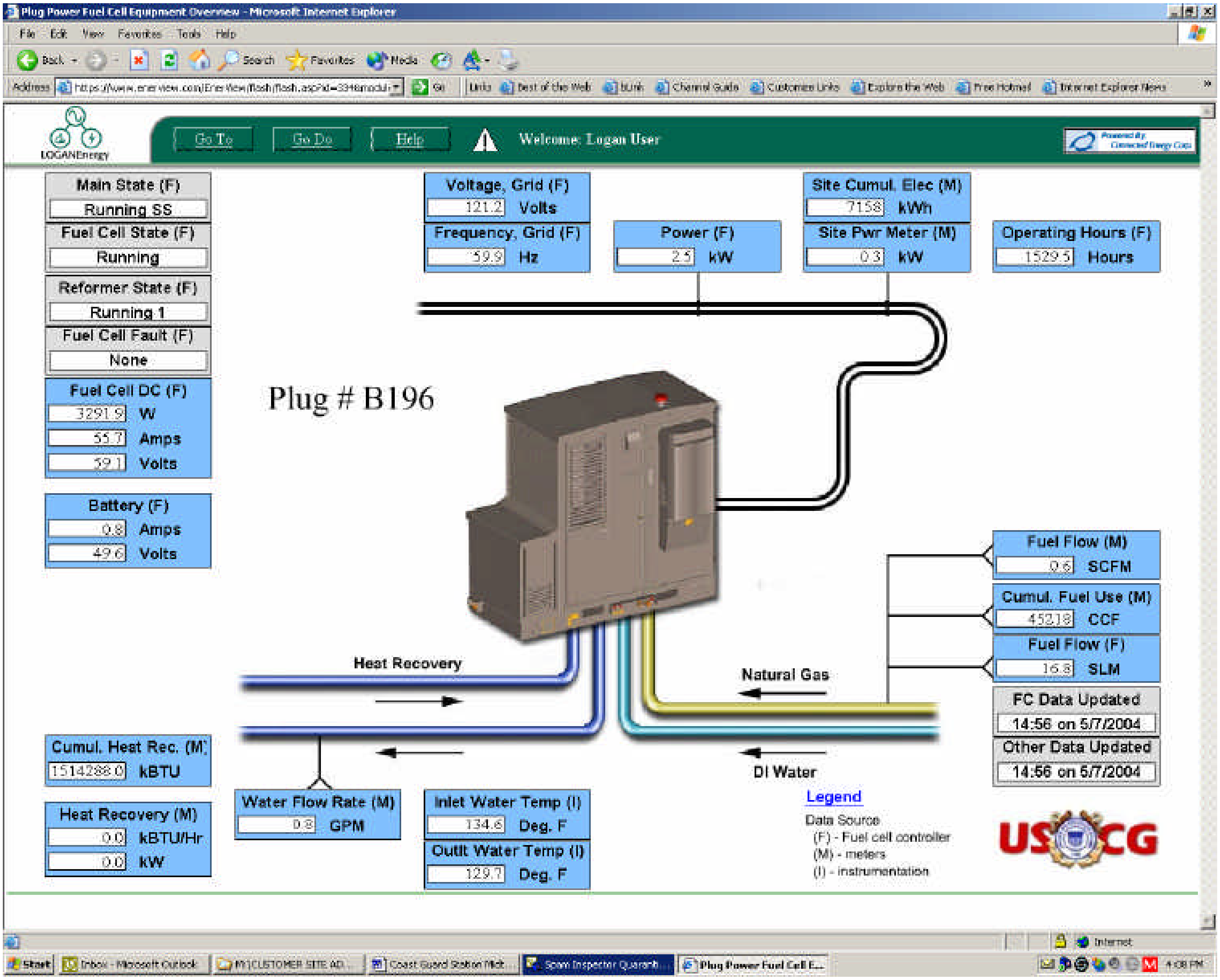

Plug Power Fuel Cell Equipment Overview - Microsoft Internet Explorer
Go To
Go Do
Help
Welcome: Logan User
LOGANEnergy
Main State (F)
Running SS
Fuel Cell State (F)
Running
Reformer State (F)
Running 1
Fuel Cell Fault (F)
None
Fuel Cell DC (F)
3291.9 W
55.7 Amps
59.1 Volts
Battery (F)
0.8 Amps
49.6 Volts
Voltage, Grid (F)
121.2 Volts
Frequency, Grid (F)
59.9 Hz
Power (F)
2.5 kW
Site Cumul. Elec (M)
7158 kWh
Site Pwr Meter (M)
0.3 kW
Operating Hours (F)
1529.5 Hours
Plug # B196
Fuel Flow (M)
0.6 SCFM
Cumul. Fuel Use (M)
452.18 CCF
Fuel Flow (F)
16.8 SLM
FC Data Updated
14:56 on 5/7/2004
Other Data Updated
14:56 on 5/7/2004
Heat Recovery
Natural Gas
DI Water
Cumul. Heat Rec. (M)
1514288.0 kBTU
Heat Recovery (M)
0.0 kBTU/Hr
0.0 kW
Water Flow Rate (M)
0.8 GPM
Inlet Water Temp (I)
134.6 Deg. F
Outlt Water Temp (I)
129.7 Deg. F
Legend
Data Source
(F) - Fuel cell controller
(M) - meters
(I) - instrumentation
USCG

Figure 8

12.0 Fuel Supply System

Gas service flows from a utility gas meter adjacent to the fuel cell pad seen in Figure 3. LOGAN installed a pressure regulator at the fuel cell gas inlet to maintain 10-14 inches water column (IWC) at the fuel cell inlet, and added a new gas meter on the fuel cell line to independently record the gas consumed by the fuel cell. This meter provides an output to a data-gathering terminal in the Ethernet/LAN cabinet seen in the line diagram in Figure 7.

13.0 Installation Costs

New Orleans Coast Guard Operations Center

Project Utility Rates					
1) Water (per 1,000 gallons)		$	2.31		
2) Utility (per KWH)		$	0.048		
3) Natural Gas (per MCF)		$	6.58		
First Cost				**Estimated**	**Actual**
Plug Power 5 kW SU-1				$ 65,000.00	$ 65,000.00
Shipping				$ 1,800.00	$ 1,500.00
Installation electrical				$ 4,200.00	$ 2,182.00
Installation mechanical & thermal				$ 3,600.00	$ 6,500.00
Watt Meter, Instrumentation, Web Package				$ 800.00	$ 673.00
Site Prep, labor materials				$ 925.00	$ 1,024.00
Technical Supervision/Start-up				$ 6,500.00	$ 5,347.00
Total				**$ 82,825.00**	**$ 82,226.00**
Assume Five Year Simple Payback				$ 16,565.00	$ 16,445.20
Forcast Operating Expenses	Volume		$/Hr	$/ Yr	
Natural Gas Mcf/ hr @ 2.5kW	0.0328	$	0.22	$ 1,703.53	
Water Gallons per Year	14,016			$ 32.38	
Total Annual Operating Cost					$ 1,735.90
Economic Summary					
Forcast Annual kWH			19710		
Annual Cost of Operating Power Plant		$	0.088	kWH	
Credit Annual Thermal Recovery Rate		$	(0.022)	kWH	
Project Net Operating Cost		$	0.066	kWH	
Displaced Utility cost		$	0.048	kWH	
Energy Savings (Cost)			($0.019)	kWH	
Annual Energy Savings (Cost)			($371.88)		

Explanation of Calculations:

Actual First Cost Total is a *sum* of all the listed first cost components.
Assumed Five Year Simple Payback is the Estimated First Cost Total *divided by* 5 years.
Forecast Operating Expenses:

The Gensys5C fuel cell set at 2.5 kW will consume 0.033 Mcf per hour. The cost per hour equals 0.033 Mcf per hour *x* $6.58, the cost of natural gas at the site. The natural gas cost per year is the cost per hour at $0.22 *x* 8760 hours per year *x* 0.9 equals $1703.53. The 0.9 is for 90% availability.

Natural gas fuel cell systems set at 2.5 kW will consume 1.6 gallons of water per hour through the DI panel. The total volume of water consumed at 14,016 gallons per year is 1.6 gph *x* 8760 hours per year. The cost per year of $32.38 equals 14,016 gph *x* cost of water of $2.31 per 1000 gallons.

The Total Annual Operating Cost, $1735.90 is the *sum of* the cost per year for the natural gas and the cost per year for the water consumption.

Economic Summary:

The Forecast Annual kWh oft 19,710 kWh is the product of 2.5 kWh operating set point for the fuel cell syste m *x* 8760 hours per year *x* 0.9. The 0.9 is for 90% availability.

The Annual Cost of Operating the Power Plant of $0.088 per kWH equals the Total Annual Operating Cost of $1735.90 *divided by* the forecast annual kWh of 19,710 kWh.

The Credit for Annual Thermal Recovery of $0.022/kWH equals 7800 BTU per hour thermal recovery at 2.5 kW *divided* by 3414BTU/kWh *multiplied* .20 recovery factor, *multiplied* by $0.048/kWh. As a credit to the cost summary, the value is expressed as a negative number.

The Project Net Operating Cost is the *sum* of the Annual Cost of Operating the Power Plant *plus* the Credit Annual Thermal Recovery.

The Project Net Operating Cost is the *sum* of the Annual Cost of Operating the Power Plant *plus* the Credit Annual Thermal Recovery.

The Displaced Utility Cost is the metered cost of paid by the Coast Guard per kWh.

Energy Savings (cost) equals the Displaced Utility Cost *minus* the Project Net Operating Cost.
Annual Energy Savings (cost) equals the Energy Savings *x* the Forecast Annual kWh.

14.0 Acceptance Test

An 8-hour acceptance test was run on September 30, 2002 by the technician. It was the first successful start-up of the system. The hours allotted for each task in the report are standard and routine. Please see Appendix 2 for documentation of the test done by the technician.

Appendix

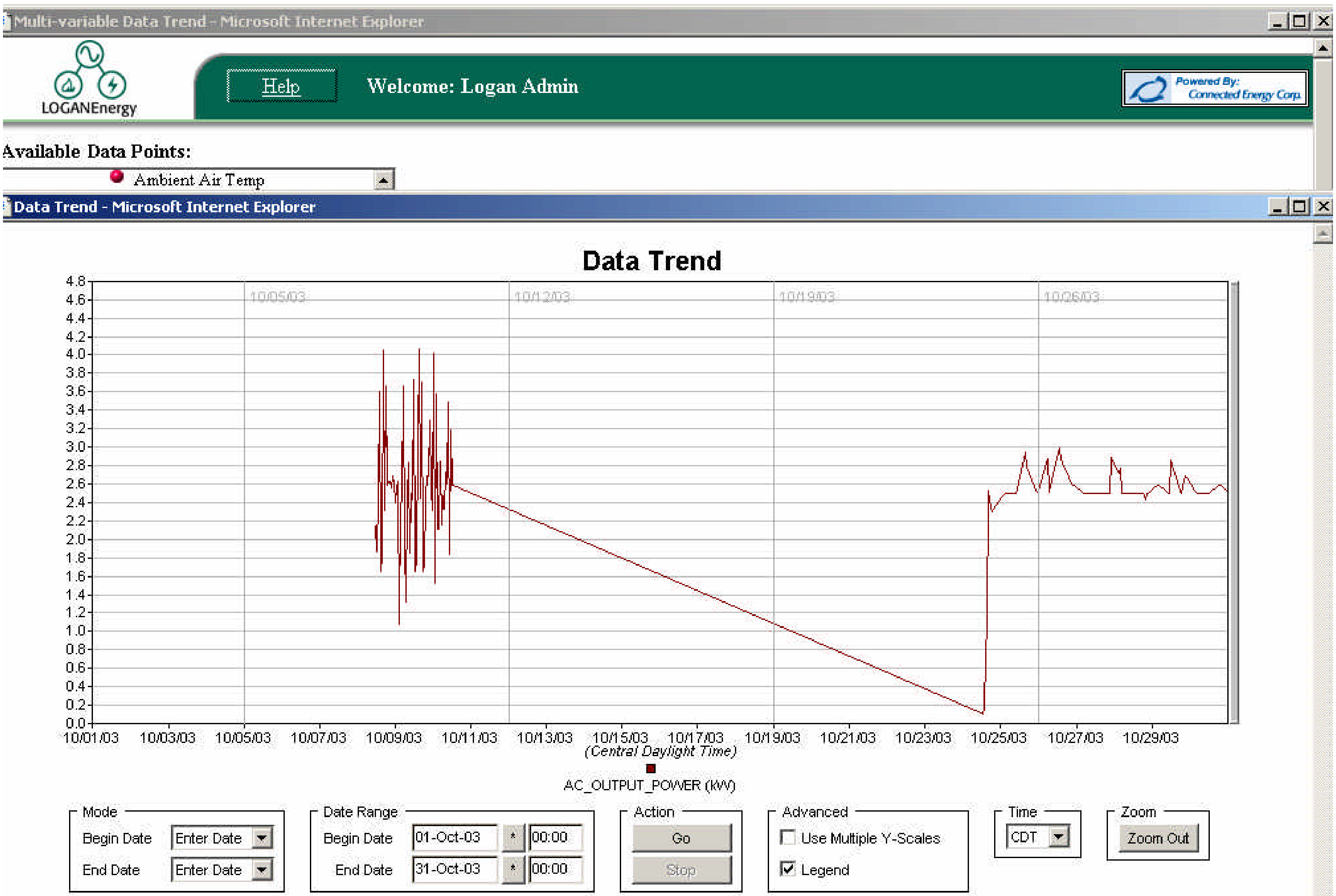
1) Monthly Performance Data
2) Acceptance Test Logs
3) Daily Work Logs

Appendix

1) Monthly Performance Data

October 2003, Initial start on October 22, 2003

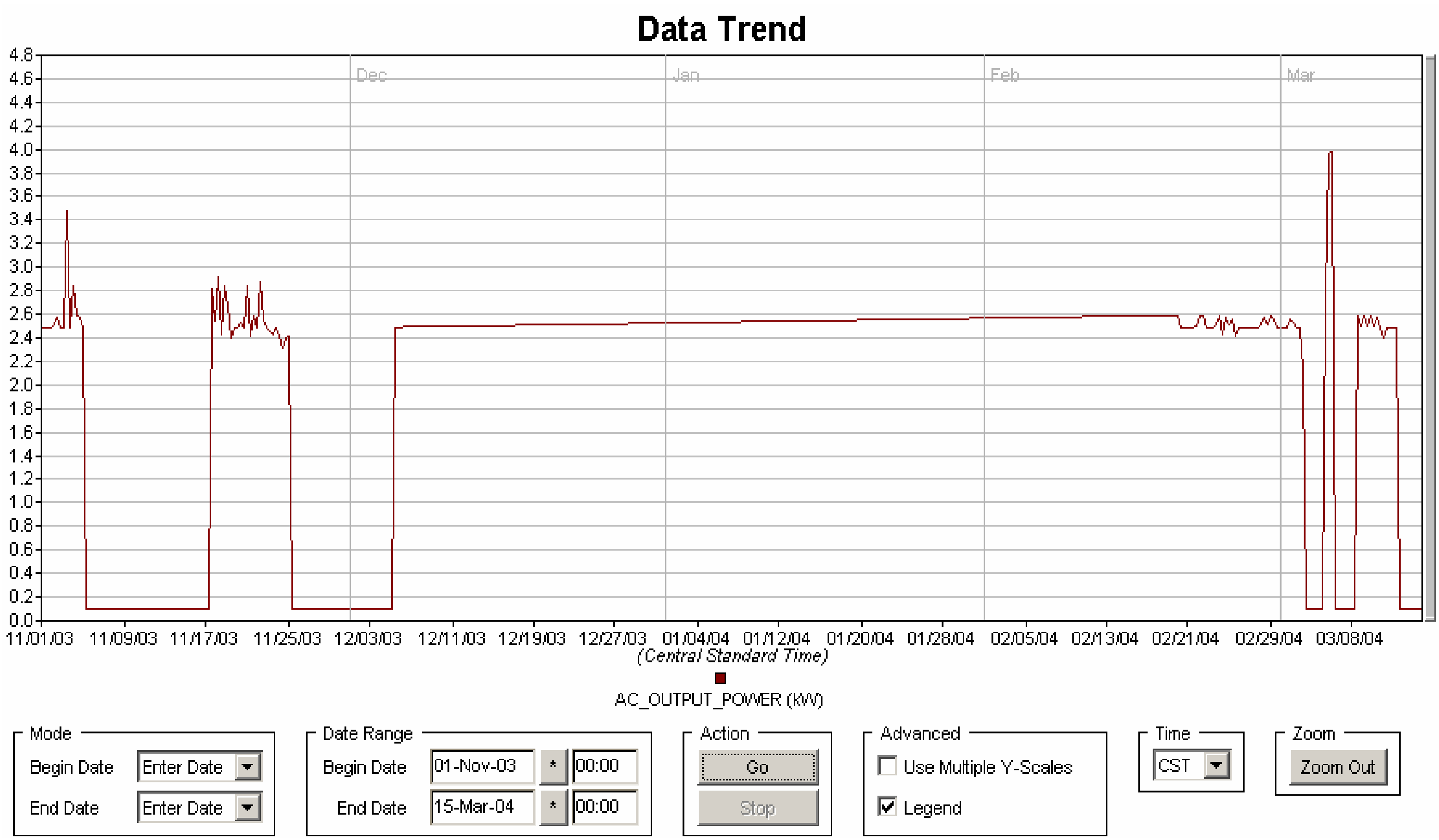
AC Power Output



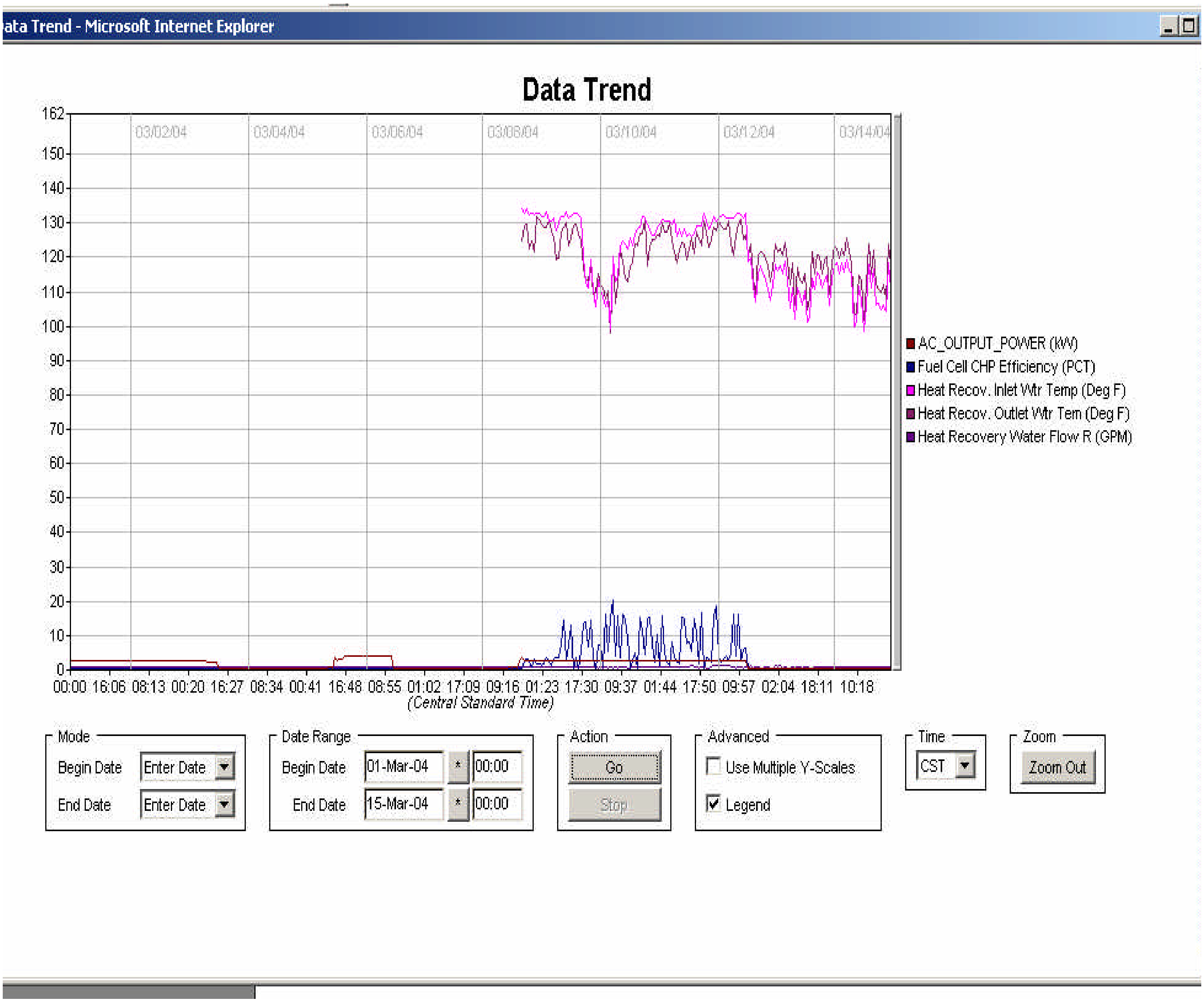
November 2003

AC Power Output kWh

Chart showing fuel cell output during the period 1 November 2003 through 15 March 2004. See the work logs in Appendix 3 below for information concerning the periods of inoperability. The flat line during the period between 5 December 2003 and 5 March 2004 is a



March 2003
Performance Data
See Key at right of graph
Site data revealed by this chart became available again after LOGAN contracted with a commercial ISP to provide high speed interconnect connection.



2) Documentation of Installation Tasks and Acceptance Test.

Installation Acceptance Test Report

Site: US Coast Guard Operations Center

New Orleans, LA

Installation Check List

TASK	Initials	DATE	TIME (hrs)
Batteries Installed	KW	8/6/03	2
Stack Installed	KW	8/6/03	4
Stack Coolant Installed	KW	8/7/03	1
Air Purged from Stack Coolant	KW	8/7/03	0.5
Radiator Coolant Installed	KW	8/7/03	3
Air Purged from Radiator Coolant	KW	8/7/03	1
J3 Cable Installed	KW	8/8/03	1
J3 Cable Wiring Tested	KW	8/8/03	0.5
Inverter Power Cable Installed	KW	8/8/03	0.5
Inverter Power Polarity Correct	KW	8/8/03	0.5
RS 232 /Modem Cable Installed	KW	8/8/03	0.5
DI Solenoid Cable Installed with Diode	KW	8/15/03	0.2
Natural Gas Pipe Installed	KW	7/03	8
DI Water / Heat Trace Installed	KW	8/15/03	2
Drain Tubing Installed	KW	8/15/03	1

Commissioning Check List and Acceptance Test

TASK	Initials	DATE	TIME (hrs)
Controls Powered Up and Communication OK	KW	8/22/03	4
SARC Name Correct	KW	8/22/03	1
Start-Up Initiated	KW	8/22/03	2
Coolant Leak Checked	KW	8/22/03	1
Flammable Gas Leak Checked	KW	8/22/03	1
Data Logging to Central Computer	KW	10/27/03	2
System Run for 8 Hours with No Failures	KW	8/27/03	8

3) Daily Work Log

Daily work log for Mike Harvell
LOGANEnergy Field Technician
June 2003 through July 7, 2003

Period **June-03**
Site US Coast Guard NOLA

Engineer	Date	PP S/N	Activity
K Williams	6/5/03		Met with Sam, Nick and Petty Officer Dunn to discuss installation and connections.
	6/6/03		Met with contractor at Coast Guard Station

Period **August-03**
Site US Coast Guard NOLA

Engineer	Date	PP S/N	Activity
K Williams			
	8/6/03	196 CGNO	Worked with George to place fuel cell on site loaded new software and inverter setpoints
	8/7/03		Worked with George to fill p/p with fluids met with contractors
	8/8/03		Started installing flow meter and temp sensors
	8/15/03	196 CGNO	Pulled wires for sensors
	8/22/03	196 CGNO	Commissioned system and started p/p ATO 2 sensor is bad but working data logging is working erratically
	8/27/03		Returned to site pleased to find p/p still running filled Heat recovery with glycol and started pumps
	8/29/03	196 CGNO	P/p shutdown but cannot determine why because data logging not working suspect ATO 2 TC but need to resolve data issue before re-start

Monthly Site Report

Period **9/1/03**

Site US Coast Guard NOLA

Engineer	Date	PP S/N	Activity
Keith Williams	9/3/03	192 CGNO	Shutdown p/p awaiting phone line or network connection
	9/29/03	192 CGNO	Worked with Mark Ginter from Connected Energy to hook up fuel cell to network
	9/30/03	192 CGNO	Finished connection made cat5 line and plugged into CG network

Monthly Site Report

Period **10/1/03**

Site US Coast Guard NOLA

Engineer	Date	PP S/N	Activity
Keith Williams	10/16/03	196 CGNO	Went to site to start p/p SARC wouldn't power up Plug sending new PDB (Power distribution board)
	10/17/03	196 CGNO	Installed new PDB still no success Plug sending new SARC
	10/24/03	196 CGNO	Installed new SARC with same result but was able to jump K1 relay and power up SARC and start p/p
	10/27/03	196 CGNO	Returned to site p/p still running verified connections with Connected Energy added Plug Power to Connected Energy call in list and commissioned the p/p

Monthly Site Report

Period **11/1/03**

Site US Coast Guard NOLA

Engineer	Date	PP S/N	Activity
K Williams	11/7/03	196	PP is running. Jumped terminals 1 & 2 on the K1 relay and power up the SARC. Installed V 1.27 software but no power up.
			Shutdown to replace gas meter and update SARC software. Jumping out K1 powers up SARC
	11/16/03		SARC and PDB installed.
	11/17/03		Filled the DI tank to its max 127% and restarted PP.

	11/26/03		Check phone line for correct polarity and voltage, and that system data logging is set up properly. Called the system and setup data logging (System parameters were not setup). Received full data set on Saturday and Sunday but no data received today will continue to monitor. Verified status via Connected Energy

Monthly Site Report

Period **12/1/03**

Site US Coast Guard NOLA

Engineer	Date	PP S/N	Activity
K Williams	12/5/03	196	Testing water issue. Changed filters…some iron contamination. Crimp in tube was restricting flow. Coast Guard removed fuel cell LAN access for security reasons.
	12/8/03		Possible leak turned up negative. P/P is running fine.

Period **1/1/04**

Site US Coast Guard NOLA

Engineer	Date	PP S/N	Activity
K Williams	1/28/04	196	Shut down PP to load new 1.28 software and replaced the stepper motor. I made sure my setpoints were good and configured the data logging. Receiving alert "remote requested shutdown". Happens when a Connected Energy box cat5 cable is connected. With the system running, unable to connect via modem. Trip planned for Thursday to check PP.
	1/31/03		Checked the stepper motor. Shut the p/p down and removed the new stepper motor. I went to change the MCB and in doing so I found one of the wires connected to the terminal strip to be just hanging in its crimp. I installed the new MCB with the newly crimped wire; it worked. Turns out the stepper motor never was the problem. The problem that alerted him was not the stepper motor itself but some odd temperatures.

Monthly Site Report

Period **2/1/04**

Site US Coast Guard NOLA

Engineer	Date	PP S/N	Activity
K Williams			
	2/4/04	**196**	Appears to be a problem with the stepper motor. Hiccup in the gas supply. Restarted the P/P
	2/5/04		This time it's the ATO flow sensor and a MCB for the cathode blower. Rob and Gary are sending parts.

2/6/04	I changed the mass flow sensor and the cathode MCB. Received "LTS SCR PROX" and had an "O2 CH4 high" shutdown. The next attempt shutdown with "ATO flow timeout". The next shutdown "recover cathode blower".
2/7/2004	I installed the new SARC but came across a low battery. Replaced battery and startup okay.
2/18/04	System Status: Shutdown Incident Description: 2/16/2004 10:52:58 AM, SHUTDOWN, KW_CONTROL_FAILURE_SD, Error Code: (511) Incident Resolution: It appears thatthere may have been a drop in Natural Gas pressure. If there is no indication that there was a pressure drop or gas curtailment then inspect all gas and air hoses and connections in the reformer prior to restart.
2/19/04	System Check OK

Monthly Site Report

Period **3/1/04**

Site US Coast Guard NOLA

Engineer	Date	PP S/N	Activity
K Williams	**3/1/2004**		System Status: Running
	3/5/04		Start up proceeded without incident. Called the p/p later and still running. That lasted till it shutdown Saturday with the same event. Will sniff it when it gets nice and hot to see if a crack is expanding and leaking gas.
	3/5/04		System Status: Shutdown Incident Description: 3/3/2004 11:31:13 AM, ESTOP, HW_ESTOP_FG3_L6, Error Code: (532) Incident Resolution: Keith Williams going to the site today.
	3/8/04		Installed the new gas meter. P/p start up. Cranked the p/p up to 4kw and sniffed one more time. I found no leaks. With modem installed. Website restored today with service from commercial ISP.
	3/8/04		System Status: Shutdown Incident Description: 3/3/2004 11:31:13 AM, ESTOP, HW_ESTOP_FG3_L6, Error Code: (532) Incident Resolution: Keith restarted the unit on Friday (3/5) but it shutdown ~26 hrs later for the same error. Heat expansion may be causing gas leak or there may be a loose wiring connection or a faulty sensor. Keith is returning to the site today.
	3/12/04		System Status: Running – requires maintenance Maintenance: DI solenoid (SOL2) is cycling only twice per day. This is an indication that the fill rate is very slow and

	could cause a shutdown soon.
3/15/04	System Status: Running – requires maintenance Maintenance: DI solenoid (SOL2) is cycling only twice per day. This is an indication that the fill rate is very slow and could cause a shutdown
3/18/04	System Status: Shutdown Maintenance: **Keith Williams is waiting for access to base to check DI water system – Post Inspection is denying access to civilians.**
3/21/04	Changed out the filters and saturated the R/O. After I adjusted flow I started the p/p. P/P ok set to 2.5kw.
3/22/04	System Status: **Shutdown... CG Security alert no access to base.** Maintenance: **Keith Williams is waiting for access to base to check DI water system – Post Inspection is denying access to civilians.**
3/31/04	System Status: **Shutdown...CG Security alert no access to base.** Incident Description: 3/26/2004 8:22:02 AM, Running (51) ESTOP, HW_ESTOP_FG3_L6, Error Code: (532)